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A Conversation About the Two Most Misunderstood Subjects in Dentistry

Gene McCoy
University of California, San Francisco

Temporomandibular Joint Disorders (TMDs) are complex conditions that affect multiple body systems. Affecting 34% of the population globally, they have been historically under researched and poorly understood. Occlusion is a subject that is perceived to be an understanding of the mastication system. Purported to be the most crucial subject in dentistry, it has earned the reputation of being the most controversial.

This conversation aims to examine the controversies inherent in each and explain their intricate relationship that has perplexed practitioners for 100 years.

THE STORY OF OCCLUSION[1]

The word occlusion is defined as closure, whether it be a door, heart valve, or teeth. However, over time the significance of the word morphed from closure to an understanding of the mastication system. The circumstances responsible for the change began early in the nineteenth century when dentists were attempting to manage the devastating effects of horizontal parafunction (Bruxism). It was not apparent that since bruxism occurs while sleeping, a guard would suffice so management focused on the best occlusal scheme to tolerate these destructive forces. The first idea was to disperse bruxism's forces by distributing them over the occlusal surfaces of the bicuspids and molars by equilibration; it was termed "*group function".* Later, D'Amico based on his studies of attrition, reduced these forces by directing them forward to the cuspid.[2]

Accordingly, a paradigm began to develop that sought to determine the best occlusal scheme to tolerate and minimize these lateral parafunctional forces; it was called functional occlusion and defined as the dynamic relationship between upper and lower teeth during normal jaw movements. Unfortunately, it was an error of judgement that would cloud our understanding of the mastication system for decades.

This paradigm was based on flawed reasoning. These were not normal jaw movements; it was classic dysfunction. Teeth rarely touch during normal jaw movements (chewing, swallowing, and speech) and only lightly if they do so.

The focus on removing enamel from the occlusal surfaces of teeth to address lateral parafunctional forces (bruxism) has led to a narrow perspective on the mastication system, neglecting other crucial aspects such as vertical parafunctional forces (clenching or Dental Compression Syndrome DCS)[3]. DCS is twice as powerful, lasts twice as long, has a unique set of footprints, focuses explicitly on the TMJ, and possesses a long list of etiological factors.[4]

To further complicate matters: the dental community then began to use the term occlusion to reference the mastication system. It added to the confusion and was a misdirection in understanding the complexity of this biological system.

To seek clarity, the term occlusion should be confined to it's true definition closure, and the mastication system should be evaluated separately. That said, what is an acceptable occlusion? Our secondary dentition presents beautiful anatomically sharp teeth, but over time there may be change; teeth may become worn or even lost. If the dentition is comfortable upon closure and does not interfere with function, the occlusion is acceptable.[5]

TEMPOROMANDIBULAR DISORDERS

Why are TMDs such an enigma? Aside from facial trauma, developmental deformities, and osteo arthritis, we seem to agree that TMDs are the result of bruxism. According to the glossary of the American Academy of Orofacial Pain, bruxism is defined as a "total parafunctional daily or nightly activity that includes grinding, gnashing, or clenching of the teeth".[6]This has led to a narrow perspective on parafunction. Lateral grinding and vertical clenching are two completely different force modes. While the condyles of bruxers seem to glide past the menisci, clenching, capable of 1,000 pounds per square inch, targets them directly resulting in damage and/or displacement. The dental community's first reaction to displacement was to replace the oval discs of cartilage that act as a shock absorber between the temporal and mandibular bones with Teflon coated implants. It did not go well resulting in the recall of 25,000 TMJ implants.[7] An article in the Wall Street Journal recounted dozens of horror stories with one implant working its way into a patient's brain: the cause clenching. [7]

We have embraced and accommodated the lateral aspect of parafunction and completely ignored the vertical, more serious threat of DCS.

A common inquiry asks the relationship of occlusion to TMDs? It would be better to question the liability of parafunction in the etiology of TMDs and then ask whether occlusion initiates the parafunction.

However, clenching and grinding of one's teeth does not always result in TMD as typing does not always result in carpal tunnel syndrome. It depends on the intensity and duration of the action and the biological strength and stamina of the person. Why women more than men? Could it be as simple as less biological strength and more prone to react to stress?

DENTAL COMPRESSION SYNDROME

DCS has been referred to as a silent disease as most people don't realize they are affected[1] which makes it critical for the practitioner to recognize the signs in the oral environment.

Non-Carious Lesions (NCLs)

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These deformations, aka sets, are multi-shaped examples of hard tissue fatigue due to compression failure. Fatigue applies to changes in the properties of a material due to repeated applications of stress or strain-in this case, compression failure from DCS. If an object, such as a tennis ball, rebounds to its original shape after repeated compressions, it is said to be elastic in nature. However, if an object exhibits residual defects after repeated compression, it is said to be plastic in nature. Biological structures, such teeth and bone are termed viscoelastic and are subject to deformation. Engineers refer to this type of fatigue as corrosion fatigue.[3]

Figure 1

The Cupola

The most common compression NCL is a perfectly rounded depression Aka; occlusal dimples, found at the tips of functional cusps. (Figure 2) Nothing of significance has been written about them except that they are associated with compression. Although the cupola contrasts dramatically in geometric design with the wedge shaped NCL, there are two striking similarities, i.e., they are both site specific in that they are found at sites of high stress on teeth, and they exhibit a glassy sheen.

Figure 2

Kornfeld wrote about this phenomenon in 1932 when he observed that these defects were hard, smooth, and glasslike in appearance.[8] The author suggests that this glassy effect is due to the exit of positive ions produced by the compression of appetite crystals in the dentition and the alveolar bone; due to a piezoelectric effect. The result is a mechanical deformation due to positive ions being emitted through these focal points of high stress which explains the glassy effect and the loss of tooth structure as well. It is not unusual to find these glassy concavities on the first molars only as they appear first in the transgression from deciduous to secondary dentition and receive the full force of compression which is reduced with the emergence of the remaining dentition.

Deformation of Bone – Exostosis

Articles on torus palatinus and torus mandibularis have appeared since 1814. Although there is no consensus as to their etiology, many associate their occurrence with TMDs and masticatory hyperfunction.[9] Specifically, the negative ions generated from the compression of appetite crystals are responsible for the aggregates of new bone growth. This may well explain the metallic taste that people experience from time to time.Fig.3,4.

Figure 3,4. Exostosis

Deformations of Restorative Materials.

Fatigue easily manifests itself in prostheses and restorative materials such as amalgam and acrylic. Termed Luder Lines or molecular slip bands, the molecules in the alloy are rearranging themselves under the influence of compressive strain. Fig. 5,6. One can demonstrate the effect by bending a metal coat hanger back and forth and examining the stress configuration that is produced.[10]

Figure 5.

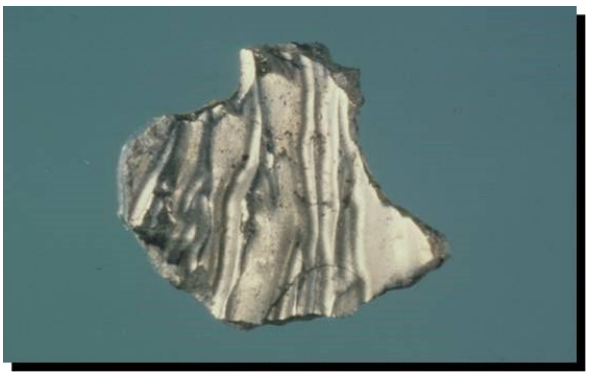

Figure6.

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DEFORMATIONS IN ACRYLIC

Fatigue in Acrylic appears as wavy lines or sets Fig. 7,8. The deformations in the oral environment are important diagnostic tools, but their appearance does not mean that the patient is currently affected with DCS, as it may have been from a prior stressful period in their lives.

Figure 7.

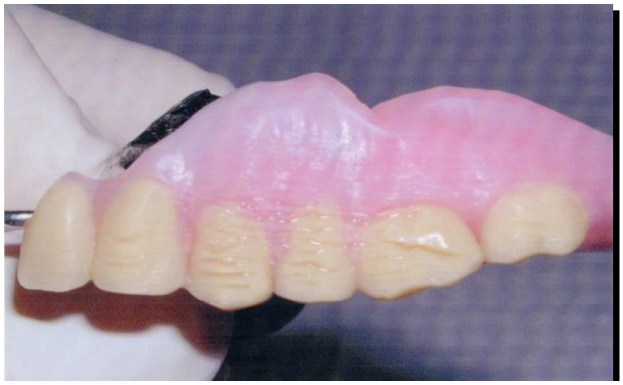

Figure 8.

ETIOLOGY

While the etiology of bruxism seems to be attributed to disturbances in the central nervous system (CNS), DCS is truly multi-factorial. Etiological factors besides CNS involvement include exercise and sports such as lifting weights and motorcycle riding, medical such as sleep apnea, pain, and numerous medications.

MANAGEMENT

DCS management is soley up to the patient as it occurs during waking hours. Practitioners can only recognize the deformations of the dentition, bone, and restorative materials in the oral environment and advise the patient. The placement of a small question mark on the patient's cell phone is a helpful reminder.

SUMMARY

The most likely etiological factor in TMDs is parafunctional forces generated from grinding (bruxism) and clenching (DCS). While bruxism can be managed with a guard; DCS cannot. Dentists can only monitor for its signs and advise patients as to its many etiological factors. DCS is a formidable threat to implant reconstructions due to the reduced volume of alveolar bone which is beneficial in dispersing parafunctional forces. Reactively relying on occlusal schemes to minimize these forces is secondary to proactively elevating patient's awareness.

To address the dilemma of occlusion, the dental community needs to adopt a more holistic view of the mastication system. It needs to recognize the limitations of the term occlusion, which has been overused, confused, and extended beyond its meaning. It needs to develop a more comprehensive understanding of the role of DCS in the etiology of TMD disorders.

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